Observations on Ancistrocladus tectorius

by

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The conserved generic name *Ancistrocladus* (ancistrus — a small hook, cladus — a branch; referring to the sympodially hooked young shoot) was first proposed by N. Wallich in 1832. A full description was provided by G. A. W. Arnott four years later. It is a rather small genus comprising about 12 species, disjunctively distributed in tropical western Africa (with about 3 species) and in southeastern Asia (with about 9 species). The only Malesian species, *Ancistrocladus tectorius* (Lour.) Merr., also known as *A. pinangianus* Planch. or A. *extensus* Planch., occurs in the Malay Peninsula, S. Sumatra, W. Borneo and their adjacent small islands. Outside of the Malesian region, this species is found in Burma, Thailand, The Andamans, Indo-China, S. China and Hainan Island. For a citation of literature and synonyms of the genus and of this species, see Steenis, 1948. The same author pointed out that owing to the deficiency of properly preserved flowering material which after drying always shinks to brittle remnants) and fruiting material in herbarium specimens, certain androecial, gynoecial, and seed characters are not fully understood, and the descriptions given by various authors are sometimes controversial. The seedling character is completely unknown.

The following observations are based on the preserved flower buds collected by Mr. Engkik Soepadmo at the Bogor Botanic Garden, and the flowers, fruit and seedlings collected by myself from Kuala Sidili, Johore, Malaysia in October, 1965 and in April, 1966. Microtome sections were made at 8–10 μ and stained with a safranin-fast green combination.

Observations

Ancistrocladus tectorius (Lour.) Merr. is a woody climber. The young plants if growing solitarily in open places are, however, more or less erect as a result of the intertwining of the vigorous young shoots. The modified young shoots are tendril-like (Plate 1, a). They consist of 3 or more sympodially arranged segments, each normally bearing a curved hook at the tip. From the extra-axillary bud of the basal segment, or sometimes from 2 or 3 buds of the basal segments of these tendril-like shoots, the dwarf foliage branches arise. Inflorescences are borne sub-terminally on the dwarf foliage branches, which in turn, are on the old stems scrambling on or above the ground. They are flat-topped, composed of profusely dichotomously branched cymes (Plate 1, b). Flowers are borne on the cymules. Penduncles are subtended by minute, ovate bracts.

Observations on the major flower parts (perianth, androecium, gynoecium), flower anatomy, fruit, seed and seedling follow.

Perianth

Calyx and corolla are clearly differentiated (Figs. 1 & 2).

The calyx is 5-lobed; the tube or hypanthium is cup-shaped. The aestivation of the calyx-lobes in all the literature is described as imbricate. From a study of the serial sections of young flower buds, it reveals that they are quincuncially arranged at the base (Fig. 2, b) with two slightly larger exterior lobes covering the other three, of which two are completely interior, and the fifth one is intermediate.

Two or three conspicuous glands are found on the waist of the external surface of some of the calyx-lobes. Usually two (very rarely three or one) of these cup-shaped glands are present on the two exterior calyx-lobes, one is found on the intermediate ones. So far, none has been observed on either of the two interior calyx-lobes. They are apothecium- or perithecium-like in the sectional views with a large number of segmented hypha-like glandular hairs compactly arranged.

The corolla consists of 5 free petals which are papery in texture, and strongly contorted (Figs. 1 & 2). Moderately thick-walled secretory cells are distributed in the parenchyma tissues of sepals and petals, especially abundant on the hypodermal layers of the abaxial surfaces.

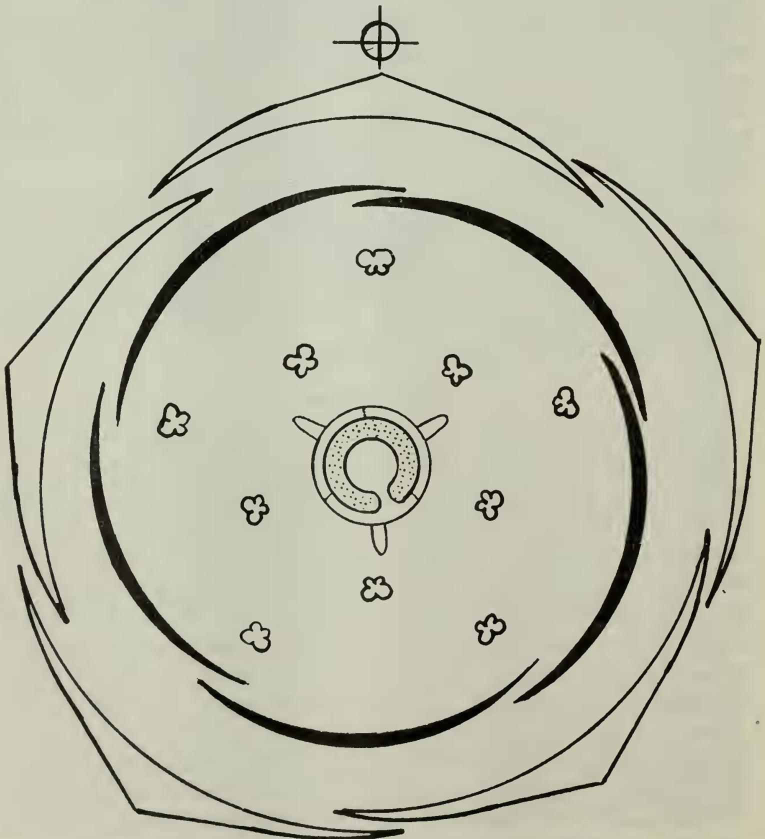


Figure 1. Floral diagram of *Ancistrocladus tectorius* Merr. (based on the transverse sections of flower buds).

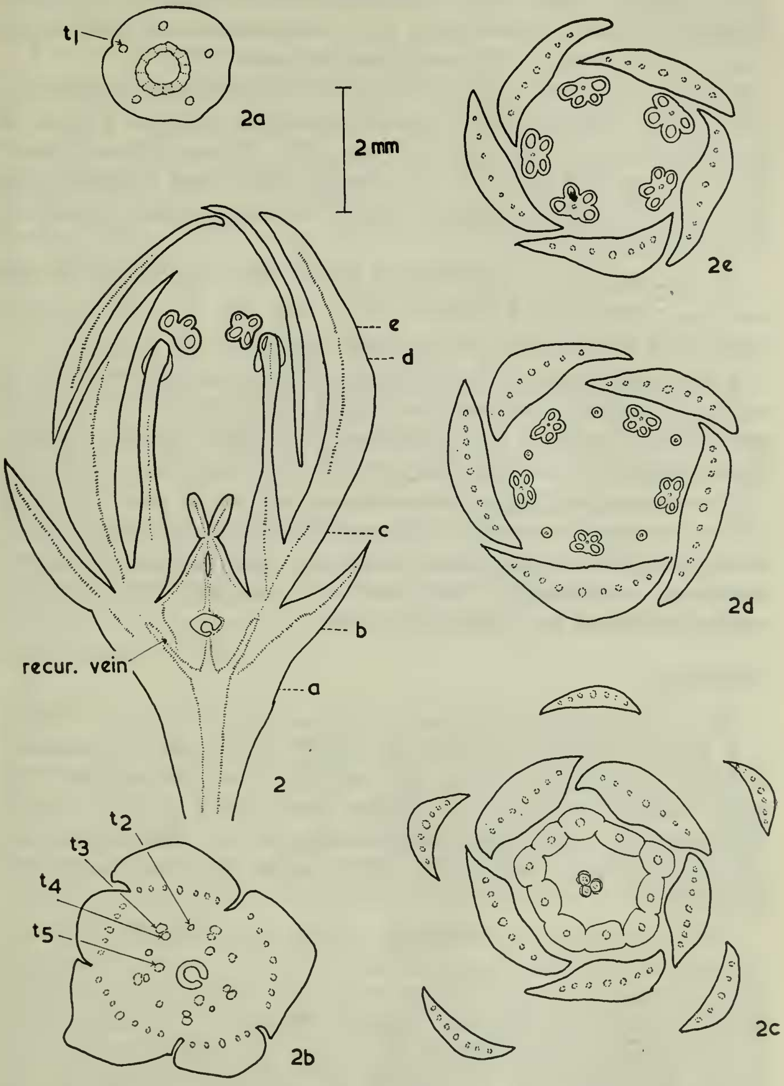


Figure 2. Flower bud of *Ancistrocladus tectorius* Merr. in sections. The position of the serial transverse sections a∾e are indicated on the longitudinal section.

Androecium

The number of stamens in a flower of the genus varies from 10 to 5. Based on this character alone, the species of the genus are arranged in 2 groups (Gilg 1895): only the Ceylonese species (*A. hamatus* Gilg) belongs to the 5-stamen group, whereas the rest, including the Malesian species belong to the 10-stamen group.

From a study of the flower sections of *A. tectorius,* two types of androecium are observed: (1) the anthers of ten stamens are almost equal in size, but the filaments differ in length, with the antisepalous ones slightly longer than the antipetalous ones, (2) the ten stamens differ in the size of their anthers and in the length of their filaments, with those of the antisepalous ones both larger and longer than those of the antipetalous ones.

The anthers are 2-lobed and 4-loculate, intro-latrorse (Plate 2, i). Owing to the disintegration of the tissue between adjacent locules of the anther—lobes, they merge and thus the mature anthers appear to be 2-loculate (Plate 2, j). The longitudinal lines of dehiscence are lateral. A short projection ('awn') is found on the upper end of each anther-lobe.

The filaments are comparatively short. They are swollen at the base and almost joined together into a ring (Fig. 2, c, Plate 2, m), which is in turn, adnate to the basal portion of the corolla.

A transverse section of a filament is orbicular or quadrangular in outline. The epidermis is cutinized and the ground tissue is composed of 2–5 layers of parenchyma cells. A single vascular bundle, often associated with a few thick-walled secretory cells is observed.

The epidermis of the anther consists of a layer of small, elongate cells with prominent nuclei. The endothecium in a mature anther is composed of a layer of very large cells with strips of secondary thickening, underneath which, one or sometimes two layers of parietal cells line the pollen sac cavity.

Gynoecium

The three styles are articulated at the medial portions (cf. Plate 2, g, h & k). The upper halves are totally free, erect or recurved, with the rounded or truncate tips probably serving as stigmas. The lower halves are partly connivent and partly joined form a cone-shaped structure. Only this cone-shaped structure is persistent and becomes very prominent in fruit, while the upper halves are deciduous.

The ovary wall is completely fused with the calyx-tube or hypanthium, therefore the position of the ovary is typically inferior (Fig. 2; Plate 2, g, h & 1). The ovary is one-loculate, one-ovulate, with the ovule basal-laterally attached (Plate 2, 1). All the sections of the flower-buds studied fail to reveal the detailed structure of the ovules themselves. It suggests that the differentiation of the tissues in the ovule comes likely at a very late stage of development.

Vascular anatomy of flower

The elongate pedicel contains a cylindric vascular region. In the receptacle at the level of sepal attachment, one single trace (which later divides into 3, 5 or 7) diverges from the vascular cylinder and enters each sepal (Fig. 2a, t_1). Above this level, the bundles which form the vascular cylinder separate and ramify. At first, 5 traces between the 5 main traces, and another 3 traces inside the main traces become clear. Each of the 5 traces (those between the main traces) (t_2 in Fig. 2b & Plate 2, n) enters into one antisepalous stamen; and all the 3 traces (those inside the main traces) (t_5 in Fig. 2b & Plate 2, n) enter into the gynoecium as dorsal traces of the carpels and end at the tips of the styles. From the main traces (t_3 in

Fig. 2a & Plate 2, n) 5 bundles further diverge; each of them divides tangentially into 2 traces, the outer one (which further divides into 3, 5 or 7 branches) and the inner one enter a petal and a antipetalous stamen respectively. The main traces themselves, however, travel in a downward direction (forming the so-called "recurrent" veins) (t_4 in Fig. 2a & Plate 2, n; also in Fig. 2 & Plate 2, 1) at low level and then bend abruptly upward and meet at the base of the ovary-locule where the placenta is located. These traces further appear on the top of the ovary-locule and finally meet the dorsal traces at the tip of the styles.

Fruit

The fruit is an indehiscent nut, enveloped by the corky hypanthium, and crowned by the shining accrescent calx-lobes (Fig. 3 & Plate 1, c). The five quincuncially arranged calyx-lobes are unequally developed: the two interior ones are usually much smaller and form the short wings; the two exterior and the fifth sepal are larger and form the long wings. In the fruiting stage their aestivation nevertheless, is almost sub-valvate.

The cone-shaped basal portions of the styles are completely fused and enlarged, constituting the persistent spherical or columnar structure. The pericarp is corky, adnate to, and inseparable from the hypanthium tissue.

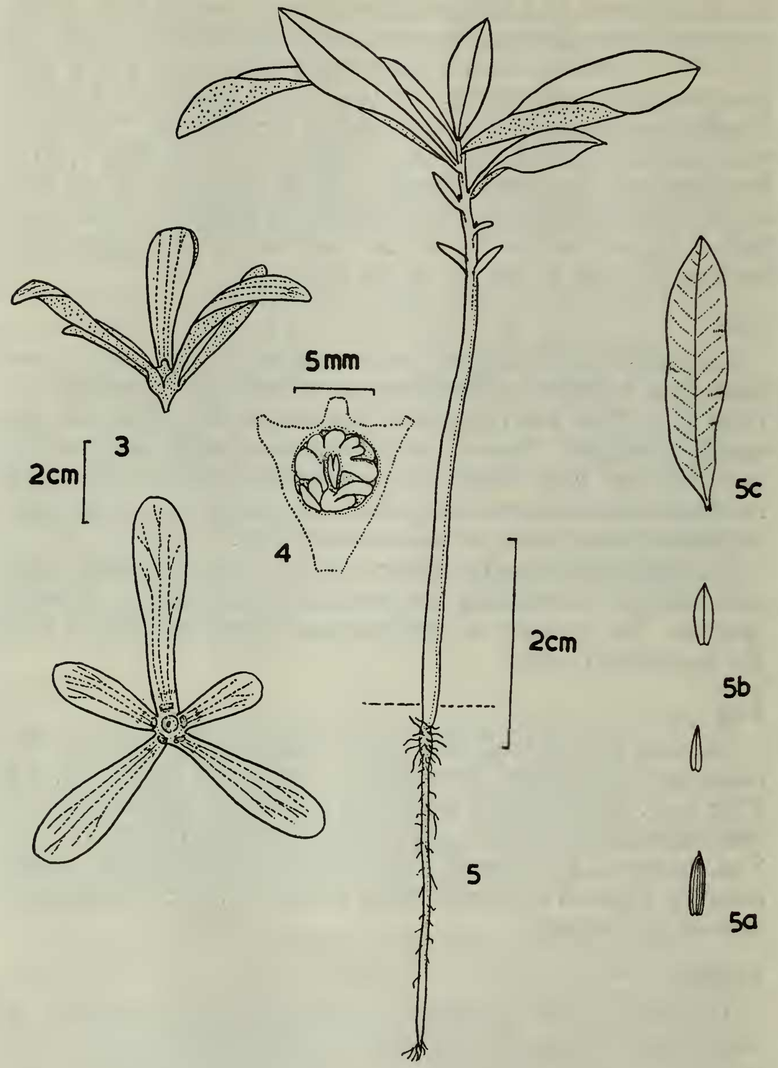
Seed

The seed is pyramidal with a thin membranceous seedcoat. The endosperm is ruminate, cerebral-like, starchy and horny (Fig. 4 & Plate 1, d). This ruminate endosperm was erroneously identified as the "remarkably folded" cotyledons (Hutchinson 1959, p. 286). The embryo is fairly small, erect, medially but generally slightly obliquely disposed and embedded in endosperm. The cotyledons are somewhat divergent.

Seedling

The primary root is slender, tapering, with a large number of short lateral rootlets (Fig. 5), black in colour. The hypocotyl is 3–5 cm. long, suberect, tetragonous and thick. The cotyledons emerge from the pericarp almost simultaneously with the well-organized young shoot (Plate 1, e & f). They are narrowly lanceolate (2–3 mm. by 0.5 mm.), sessile and prolonged decurrent at the base, wither and cease to function at a very early stage and when they are replaced by the foliage leaves. The transitional leaves (Fig. 5, b) usually two, are subulate, (3–4 mm. by 0.6–0.8 mm.) sessile and decurrent.

The foliage leaves on young seedlings are simple, entire, exstipulate, alternate and spirally arranged (Fig. 5). The lamina of each is elliptic or lanceolate (1.5–3.5 cm. by 0.6–1.2 cm.), glabrous, deep green above, with a distinct midrib; the lateral nerves are inconspicuous. Their petioles are very short (2–3 mm. long) and strongly decurrent, usually with a large purplish crateriform gland on the exterior surface near the base.



Figures 3–5. *Ancistrocladus tectorius* Merr.

3. Winged fruit, in two different views.
4. Sectional view of the seed (semi-diagramatic).
5. A seedling. 5a, a cotyledon; 5b, two transitional leaves; 5c, a juvenile foliage leaf.

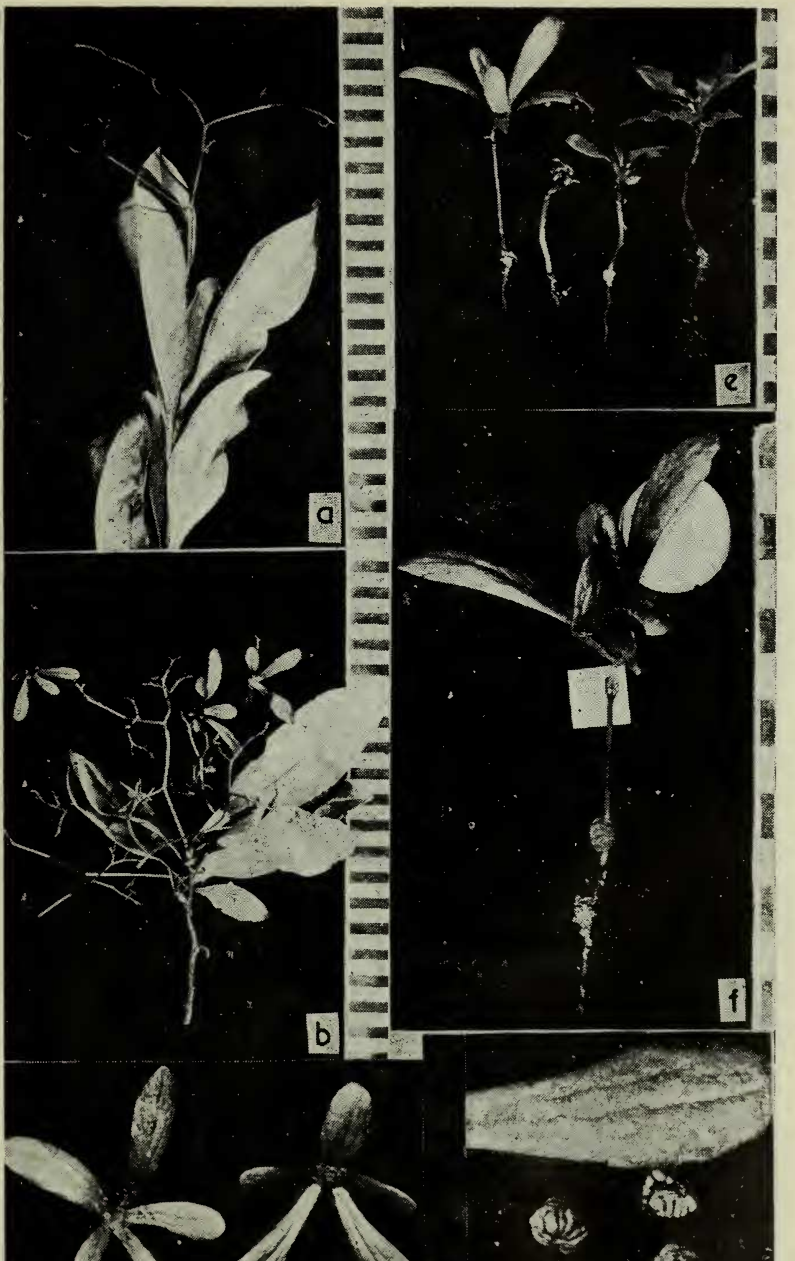


Plate 1. *Ancistrocladus tectorius* Merr.

(*a*) Terminal branch bearing tendril-like young shoots; (*b*) Fruiting inflorescence; (*c*) Two winged fruits; (*d*) Seeds (external and sectional views); (*e*) Seedlings in various stages of development; (*f*) Detail of *e*. A young seedling showing the radicle, hypocotyl and cotyledons (with white background) just emerged from the pericarp.

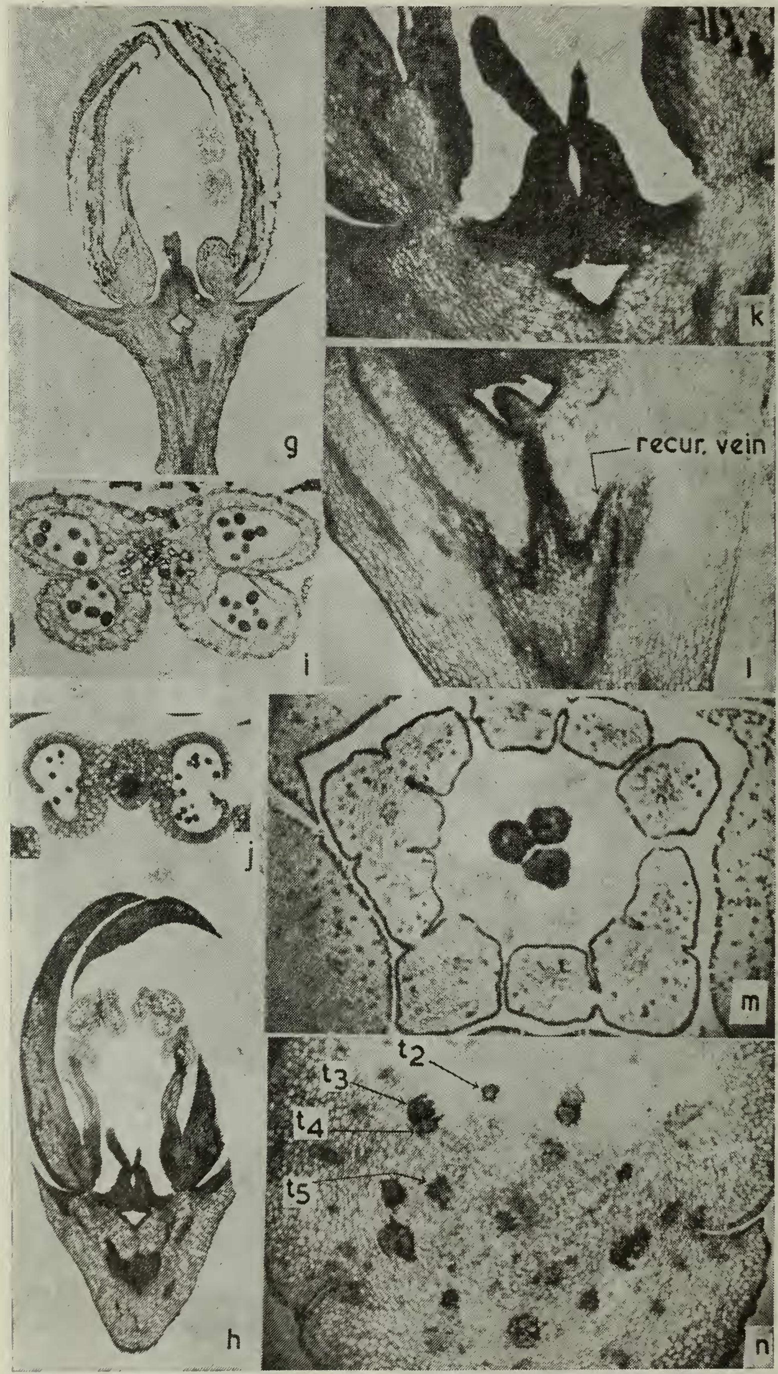


Plate 2. *Ancistrocladus tectorius* Merr.

(*g*) and (*h*) Longitudinal sections of flower buds (cf. fig. 2); (*i*) and (*j*) young and mature anthers in transverse sections; (*k*) Detail of *h*, showing style structures; (*l*) Enlargement of portion of a longitudinal section of the flower bud, showing the basi-laterally attached ovule and the reccurent veins (cf. fig. 2); (*m*) Transverse section of a flower bud showing the filaments almost joined together into a ring (slightly above the level showing in fig. 2, c); (*n*) Transverse section of flower bud through the receptacular region showing the vasculature (slightly below the level showing in fig. 2, b).

Phylogenetic consideration — A review

The genus of *Ancistrocladus* in modern classification systems is generally considered to represent a monogeneric family, the Ancistrocladaceae. The phylogenetic position of this family, however, is not well established. There are very few, if any, angiosperous families like the Ancistrocladaceae which it has been suggested at one time or another is related to such vastly distinct families as: Annonaceae, Combretaceae, Dioncophyllaceae, Dipterocarpaceae, Linaceae, Malpighiaceae, Myristicaceae, Pittosporaceae, Symplocaceae, Violaceae (Gilg 1995, Melchior 1964, Steenis 1948).

Current opinions still revolve around the placement of the Ancistrocladaceae in either the Guttiferales (or Parietales in part, including Dipterocarpaceae, Dioncophyllaceae and others) or the Geraniales (including Linaceae and others). Hutchinson (1959) shares with Planchon's original view that this family and the Dipterocarpaceae are closely related and both are classified under his order Ochnales. At first, Erdtman (1952) stated that pollen morphological evidence did not conflict with this family being referred to, or placed near to such families as Cactaceae, Dipterocarpaceae and Theaceae. He later (1958, cited by Melchior 1964) pointed out the similarities between pollen grains of this family and the Dinocophyllaceae, a small monogeneric African family which is grouped under the Guttiferae by Melchior (1964). Steenis (1948) listed a number of important characters which distinguish this family from the Dipterocarpaceae; he appears to be in favour of Miquel's and Hallier f.'s suggestion that this family is probably allied to the Linaceae-Hugoniaceae.

No positive conclusion can be drawn without thorough comparative morphological study of the above-mentioned taxa. The present writer, nevertheless, feels that the resemblance of the persistent and accrescent calyx-lobes in Ancistrocladaceae and Dipterocarpaceae is rather superficial. Similar types of fruit can be found in other unrelated families (Ridley 1930, pp. 103–112). The seed and seedling characters apparently indicate no affinities existing between these two families.

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